

Application of the eduScrum methodology to a higher education institution in the Amazon

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Abstract

The objective of this work is to report the implementation process of the eduscrum methodology in the postgraduate courses in industrial engineering at a faculty located in the Amazon. EduScrum is a collaborative learning strategy and an effective management framework for group projects that enhances student engagement and development of a mind-set that aims for constant improvement. The text presents the history, facts and concepts about eduscrum and the step-by-step process of technology transfer between the proposer of the technique and the institution of higher education. The difficulties encountered and the adaptations necessary to apply the technique in the Brazilian educational scenario are detailed. The text presents the results obtained in the first 18 months of implementation of the methodology and the main competences developed by the teachers to adapt to eduScrum.

Keywords: Active Learning; Engineering Education; Student engagement; eduScrum.

1 Introduction

The use of agile methodologies is growing rapidly in the information technology industry. For Scott *et al.* (2014), Scrum is widely used in computing companies by increasing team productivity, quality, and customer satisfaction. Simultaneously with industry, educational institutions also focused on the use of agile techniques in the academic environment, leading Scrum to become an effective strategy for preparing students to meet the challenges of the job market.

In 2013, the Dutch professor of science, Willy Wijnands, proposes a pedagogical application of Scrum. He is the initiator and founder of EduScrum and uses Scrum's ceremonies, roles, and tools in the classroom.

For Devedzic & Milenkovic (2011), the EduScrum framework, when applied in education, reinforces students' skills gain, which is motivated by facing real day-to-day work problems rather than doing tests or theoretical exercises.

According to Zapater *et al.* (2013), the combination of agile methodologies and problem-based learning (PBL) in education promotes students' engagement in real work tasks with real constraints on work costs and capacity, which leads to understand how to handle complex systems. It also creates conditions for cooperation and teamwork in a self-regulated environment. Students should be able to organize themselves, dividing the work in a way that allows them to learn and integrate what was produced by the group, proposing a solution to the problem. For effective teamwork, they need to understand the benefits of good planning and the use of development tools.

Still according to Zapater *et al.* (2013) in this scenario students are faced with a problem that needs to be solved and learn new techniques in the areas involved in the design and implementation of their solution. For this, they should be encouraged to find their own solutions to a problem, becoming proficient in certain areas or through the advice of experts.

In order to guarantee the best results in the teaching-learning process, the teacher needs to develop a set of skills in order to prepare the classes, apply the appropriate didactic resources in face-to-face meetings and correctly evaluate the students' understanding of the developed studies. Without the development of these skills, the course does not unfold under the right conditions. EduScrum decrees the end of the exclusively expositive classes and the use of didactic material in the traditional format.

2 Description of eduScrum

For Ferreira and Martins (2016), students are divided into groups and are given to them a set of requirements to train skills related to problem solving, communication and project management in a controlled environment. The groups can be formed by the students or defined by the teacher. During a sprint, which is a period of work, the group needs to develop or solve a set of activities related to the learning objectives of the course.

According to Ferreira and Martins (2016), activities can be broken down into several tasks. This process uses the Fibonacci sequence (1, 1, 2, 3, 5, 8, 13, 21, ...) to define the complexity and estimate the amount of effort to implement each piece of work. For Mahnic (2012), in the progress of activities, Scrum uses problem-solving practice, and therefore, students develop the skills of estimating the efforts of each task, planning the work, monitoring the speed of delivery of the tasks. and completeness of tasks.

EduScrum has 3 ceremonies: stand-up, sprint review and sprint retrospective. The stand-up occurs at the beginning of a school day and sharpens students' focus on work mode. In the sprint retrospective, the group should write a brief review of the 3 issues related to team performance during the sprint: what went well, what went wrong and what needs to be improved in the next sprint. Already in the sprint review, eduScrum artifacts are updated and the actual status of the project can be gauged. For Scott et al. (2015), during the sprint review, the team must present what was done during the sprint so that the teacher examines the work done and gives feedback.

Figure 1 shows the stages of the eduscrum framework. For Dinis-Carvalho *et al.* (2017), in the beginning, a set of requirements is organized by the teacher forming the product backlog. Tasks are grouped into sprints, with each sprint having a subset of the product backlog. Throughout the sprint team members get involved with the activities and have to deliver some product at the end. It could be, for example, a report with the solutions found for a problem.

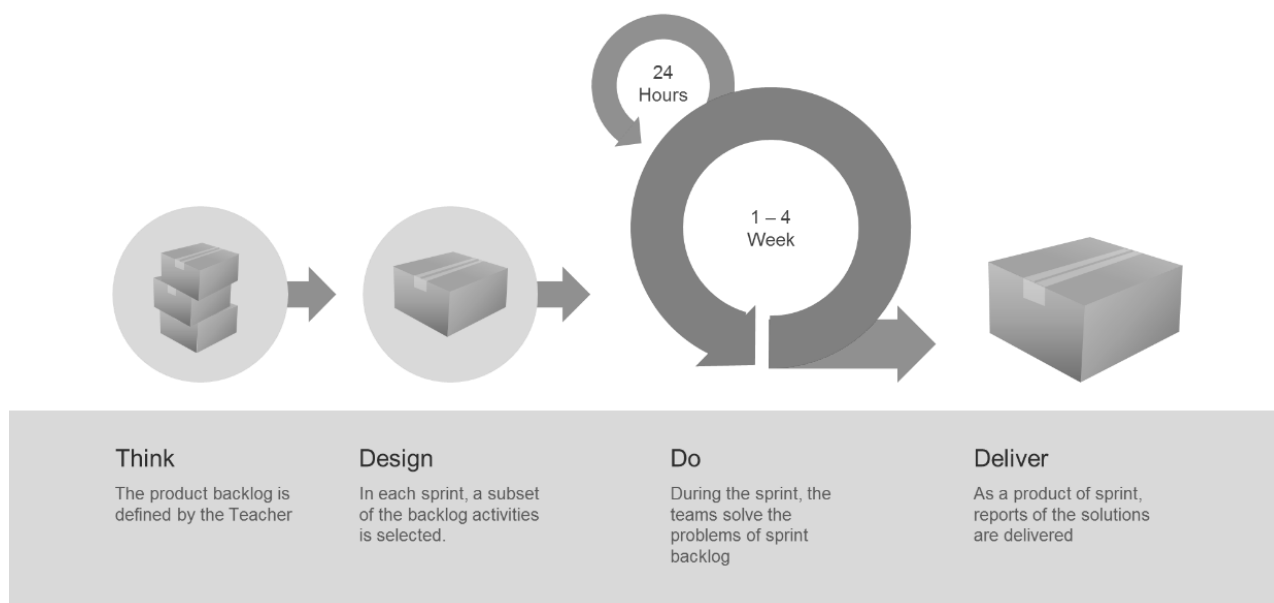


Figure 1. Scrum framework diagram for education.

Figure 2 shows the 3 roles of eduScrum are product owner, scrum master and team members. The product owner in eduscrum is the teacher who manages and defines the product backlog. The scrum master is one of the team members who guides the teams so that the Scrum rules are properly conducted. All others from team members develops the requirements.

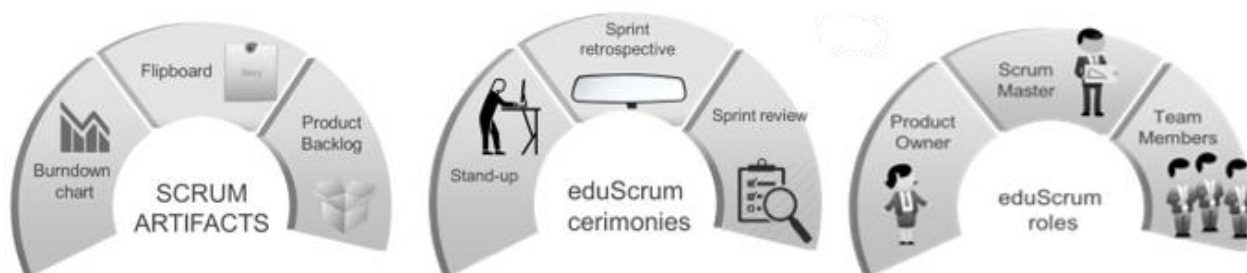


Figure 2. Artifacts, ceremonies and roles eduScrum

Besides the product backlog, eduscrum has two other artifacts: the burndown chart and the flipboard. The flipboard is a simple 3-column table: To Do, In Progress, and Done. At the beginning of the first sprint, all tasks are allocated in the To Do column. As they begin, they are shifted to "In Progress." When you complete an activity, the group moves it on the flipboard to the "Completed" column. The burndown chart allows the group to control the use of the. Time and how the activities will be developed in each sprint.

3 Teaching skills

During the initial 18 months of implementation of the eduscrum methodology at IDAAM Faculties, several challenges were encountered. Teachers underwent trainings and needed to adapt the supporting texts of the subjects, the dynamics used in the classroom and the use of time in face-to-face meetings. The assignments of degrees to the students started to be upon the deliveries of the teams and not related to the individual performance. In this process, some teaching competences were more strongly highlighted as priorities. Figure 3 presents a conceptual map of these skills.

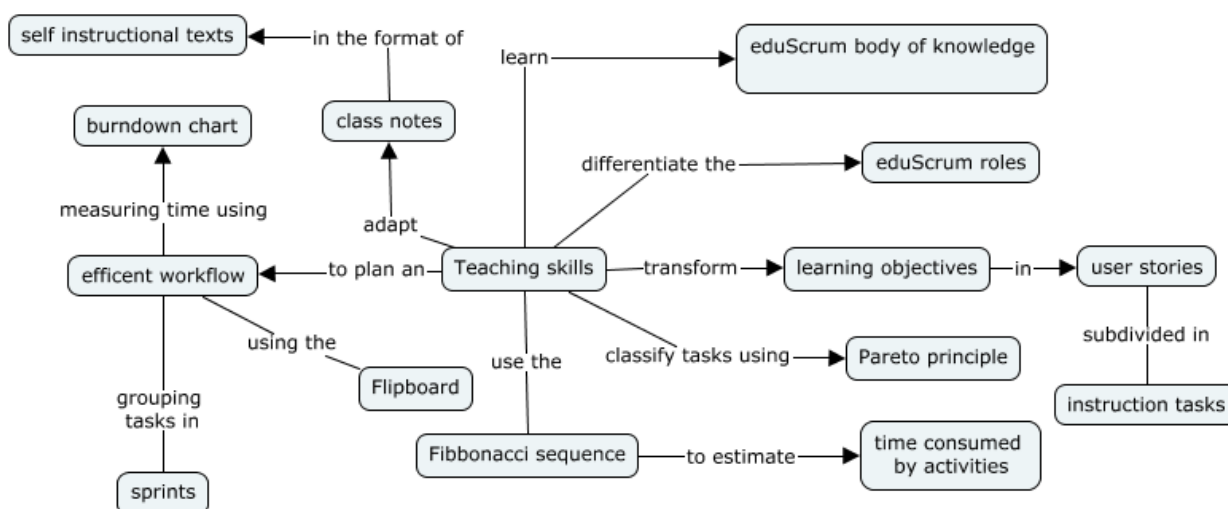


Figure 3 - teacher skills concept map

The methodology applied in this work is summarized the qualification of the body of teachers, with specific training in the teaching competencies identified as priorities. It is an action research focused on the development and articulation of teachers in the application of eduscrum in 4 specific dimensions: eduscrum body of knowledge, lesson planning, class execution and writing of supporting texts.

The first dimension concerns the study and understanding of the philosophy behind the eduscrum and the guides and manuals developed by its proposer Willy Wijnands. The second dimension involves applying the correct division of roles experienced by students and teachers, transforming learning objectives into user stories, and prioritizing planning, time and resources of instructional activities. The third dimension encompasses efficient classroom workflow with the use of features such as the flipboard and the burndown graph. It also covers the grouping of activities in sprints and the management of deliveries and deadlines. The last dimension concerns the transformation of class notes into self-instructional texts that allow the

advancement of teams without the constant intervention of the teacher and thus give greater autonomy to eduscrum teams.

For Bettio et al. (2013) there is a similarity between class preparation, learning objects construction, and software development. In the educational process, the requirements are set by the teacher (Product Owner). This group of requirements is called Product Backlog. For the same author, in each development cycle, called a sprint, a meeting called Stand-up is done in a way to select a set of requirements for implementation. This group of requirements is called sprint Backlog. Once activities are defined, the development cycle (Sprint) is started. The loop is executed until the tasks are completed, or the time set for the sprint is reached. Requirements can be added or removed. A characteristic of Scrum is the stable tempo of a sprint. It is expected that at the end of a sprint, that a group of requirements has been finalized. At this point, a retrospective is done to identify issues and solutions that will be used in the next sprint.

In the process of transferring methodology from Ashram College to IDAAM, there was the direct participation of Professor Willy Wijnands. As initial skills, each local teacher received the eduScrum user's guide. This body of knowledge integrates the main facts and concepts of Eduscrum, such as roles, ceremonies, and artifacts.

After this initial stage, the learning objectives of each discipline are elaborated. These are written in the form of user stories. The objectives are then broken down into activities with order of prerequisites so that at the end of them the proposed competence will be consolidated by the participants. These tasks are classified using the Pareto principle, so that if there is a time constraint, the activities that are a priority are clear. These activities at this planning stage have the estimated time of achievement using the Fibonacci sequence or the poker cards.

With the work sequence developed, the workflow is planned. This is done by grouping the various product backlog activities into sprints that last on average 21 days. For the visual management of the work two artifacts are used: the flipboard and the burndown chart. The first one helps to control the running tasks, avoiding the situation where many tasks are started without being completed. It also allows to monitor if there are blocked tasks that require the direct intercession of the teacher. Burndown shows whether students are on time, whether they are early or late. This allows the elaboration of contingency plans. Figure 4 shows this two artifacts.

In order to adapt the flow of lessons to the new model, the supporting texts in traditional format need to be adapted. This is where the instructional notes of class come in, creating a context of greater autonomy for the work of the teams.

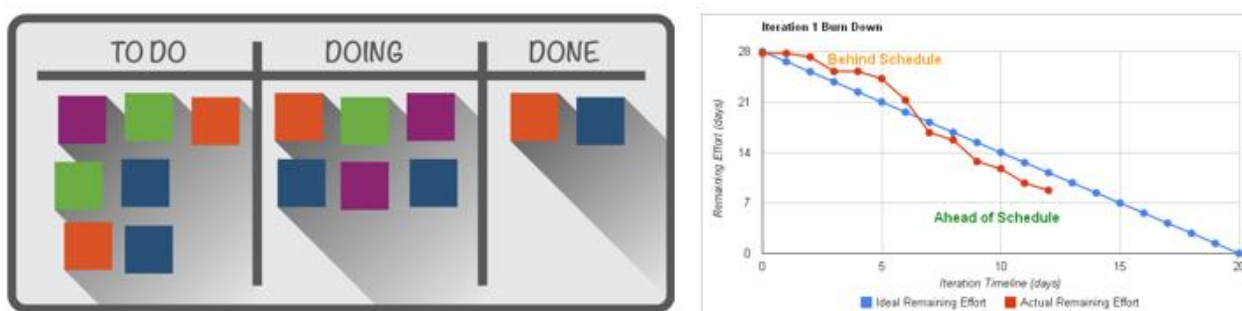


Figure 4 – Flipboard (left) and burndown chart (right)

4 Conclusion

After one and a half years of work, eduScrum has not yet been fully deployed. However the results achieved have already made the classes more skill developers. The meetings are less and less composed of traditional expositive presentations. Students are more engaged and activities are more like day-to-day work: participatory problem-solving meetings. The growth and ripening curve is slow but promising. The results achieved to date are based on the training of teachers and the flexibility of the faculty to adopt the methods, principles and values of eduscrum. For future work, comparisons will be made in the opinion polls of students

before and after the implementation of eduscrum to evaluate the level of students' adherence to the new method.

5 Acknowledgements

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